The Northwestern MILLER

MILLING PRODUCTION SECTION

All Stocks Are Air-Borne in Canada's Newest Mill

1,300-Bbl. Plant of Copeland Flour Mills. Ltd., Claimed to Be the First of Its Kind in the North American Continent

By Paul L. Dittemore
Technical Editor, The Northwestern Miller

WHAT is claimed to be the first completely pneumatic flour mill on the North American continent recently was put into operation. The mill is the 1,300-bbl. plant of the Copeland Flour Mills, Ltd., at Midland, Ontario, a town of about 6,500 population approximately 125 miles north of Toronto. The mill was designed and built by Henry Simon, Ltd., Cheadle Heath, Stockport, England.

The Simon low pressure pneumatic conveying system is a feature of the mill. This system was the subject of an article in the December, 1950, issue of this journal. The essential features of the low pressure system are: (1) Elimination of horizontal pneumatic conveying as far as possible. (2) Use of a small agitator or "diffusor" at the junction of the vertical and diagonal spouting to keep the flour particles suspended in the moving air; and, (3) Use of considerably less air in conveying than formerly was believed to be required.

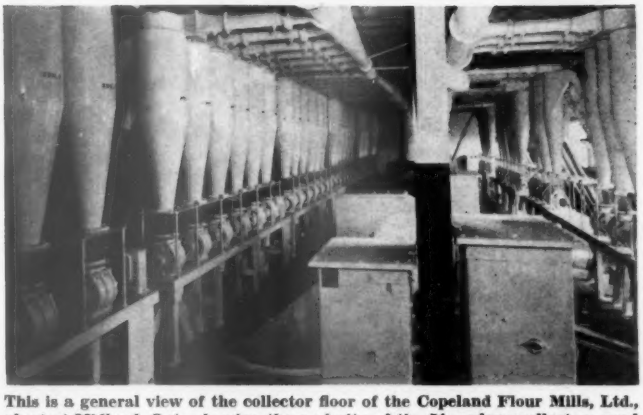
When flour mill engineers began experimenting with pneumatic conveying systems a few years ago, the initial systems required a considerable volume of air to move the mill stocks. The engineering handbooks all state that the volume of air delivered by a fan varies directly as the fan speed, that the pressure produced by a fan varies as the square of the fan speed, and that the horsepower required to drive a fan varies as the cube of the fan speed.

From those fundamentals of air handling engineering, it is apparent that large volumes of air at relatively high pressures require a lot of power, and power costs money. The opinion was soon formed by millers that any pneumatic conveying system would require from one and one half to two times the power as the conventional bucket elevator system to operate.

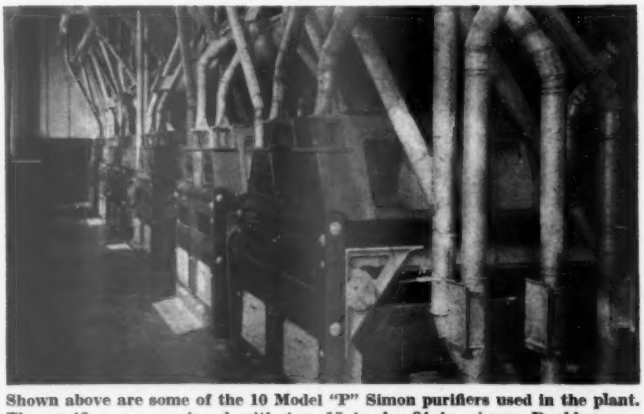
Power Requirements About Equal

The Copeland firm is in a good position to compare power requirements for a pneumatic mill as opposed to the conventional type. The plant has

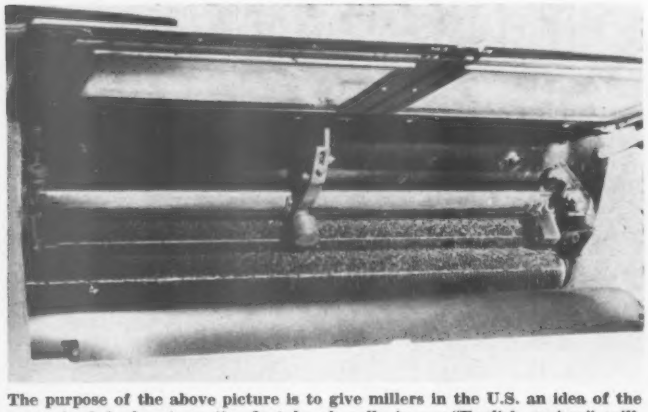
(Continued on page 16a)



This is a general view of the collector floor of the Copeland Flour Mills, Ltd., plant at Midland, Ont., showing the majority of the 54 cyclone collectors used in the 100% pneumatic system.



Shown above are some of the 10 Model "P" Simon purifiers used in the plant. The purifiers are equipped with two 15 in. by 84 in. sieves. Double-screw conveyors collect the stock.



The purpose of the above picture is to give millers in the U.S. an idea of the amount of feed put on the first break rolls in an "English system" mill. The rolls are 10 in. by 40 in. Simon stands.

The roll floor in the plant of Copeland Flour Mills, Ltd., Midland, Ont. In the picture are a few of the 22 double stands of 10 in. by 40 in. rolls used in the 1,300-bbl. mill. The rolls are of Simon manufacture.

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Field Infestation of Ripening Wheat by Stored Grain Insects

By H. H. Walkden

Bureau af Entomology and Plant Quarantine
U. S. Department of Agriculture

EACH year during the wheat harvest, reports of weevil damage in newly harvested wheat reach the Hutchinson, Kansas, office of the Bureau of Entomology and Plant Quarantine. Many wheat growers believe that ripening wheat is infested in the field by stored-grain insects.

Observations were made in the vicinity of Hutchinson during the 1950 harvest to determine the intensity of field infestation, if any, by stored-grain insects, and the species involved. Data on the relative abundance of insects in farm-stored grain in Reno County in July of each year from 1945 to 1950, inclusive, were studied.

Cages were set up in a field of ripening wheat to determine whether rice weevils released in them were able to infest the wheat. These cages were 2 ft. square and 3 ft. high and were covered with unbleached muslin (Fig. 1).

Two hundred rice weevils were released in each cage. After the required exposure period the wheat was harvested and hand-threshed and the grain was placed in pint jars, which were then sealed. The first cage was set on June 9, when the grain was in the soft-dough stage, and the exposure period was one week. The second cage was placed in the field on June 16, when the grain was in the hard-dough stage, and was exposed for one week. The third cage was set on June 20 and was exposed for three days. The wheat was ripe and the whole field was harvested at that time.

The three samples of wheat that had been exposed to weevils in the field were incubated and examined at weekly intervals to detect any emergence. No emergence had occurred up to Oct. 1. These samples were stained by the acid-fuchsin method, and no weevil egg punctures were found. It seems likely that the weevils were unable to penetrate the glumes to lay eggs in the wheat kernels. Under unusual conditions, where the wheat heads are damaged so as to expose the kernels, infestation could occur.

In addition to the exposure of ripening wheat to weevil infestation, samples of new wheat, fresh from the combine, were taken from trucks as they were being unloaded at a local elevator. Samples consisting of 1 pint each, taken from 30 trucks, were examined and all kernels showing evidence of insect damage were counted. Of these samples 28 contained kernels showing insect feeding. Most of the damage consisted of injury to the germ or of jagged holes cut in the bran coat, penetrating the starch in varying depths. Most of the feeding areas, however, were rather shallow. Less than .01% of the kernels showed insect damage. A few of the holes appeared to have been burrowed by a weevil, but it was apparent that all of the damage had been done by insects feeding from the outside of the kernel, rather than from the inside, as is typical of emergence holes made by the rice weevil. The differences in the character of the injury are shown in figures 2 and 3. The holes made by the rice weevil (Fig. 2) were sharp-edged, whereas those in the kernels taken from the truck samples had broadly rounded edges (Fig. 3).

Several species of insects are known to damage the heads of ripening wheat. Among these are the armyworm (Cirphis unipuncta (Haw.)), the wheat head armyworm (Protoleucania albilinea (Hbn.)), adults of the wheat white grub (Phyllophaga lanceolata (Say)), and various species of grasshoppers. The type of damage illustrated in Figure 3 was no doubt incidental to the feeding of one or more of these or other species on the glumes and beards of the wheat heads, and is not characteristic of damage by stored-grain insects.

After all these samples had been examined, they were sealed in pint jars and incubated throughout the summer for possible emergence of weevils or other stored-grain insects. No emergence had occurred up to Oct. 1. When stained by the acid-fuchsin method, the samples failed to show any weevil egg punctures.

Observations to determine the comparative abundance of various species attacking farm-stored grain indicated that in July only 4% of the total number of insects observed belonged in the weevil group, i.e., granary weevil, rice weevil and lesser grain borer. By August the proportion of these three species had risen to 8%, and by September to 9% of the total insect population. The relative abundance of the various species of insects found in farm-stored grain in July of each year is shown in Table 1. From these data it is evident that approximately two weeks after the wheat was put in farm storage the weevil populations constituted only a small percentage of the total number of insects. If field infestation by the weevil had been at all common, the weevil population of binned grain would have been much higher.

These observations indicate that field infestation of ripening wheat by stored-grain insects does not normally occur in the vicinity of Hutchinson, Kansas, or, if it does occur, it is too rare to be revealed by the methods used in this study.

Fig. 1—A muslin-covered cage in which rice weevils were confined to test their ability to infest ripening wheat.

Table 1—Comparative Abundance of Various Insects Found in Farm-Stored Grain During July in Reno County, Kansas, 1945-50

Species—	Per cent of total insects observed— 1945	1946	1947	1948	1949	1950	Mean
Bran beetles—							
Saw-toothed grain beetle (Oryzaephilus surinamensis (L.))	48	62	53	41	22	77	47
Flat grain beetle (Laemophloeus pusillus (Schönh.))	45	17	24	27	40	2	27
Cadelle (Tenebroides mauritanicus (L.))	Tr.	13	5	10	9	2	7
Hairy fungus beetle (Typhaea stercorea (L.))	1	1	4	8	4	Tr.	4
Small-eyed flour beetle (Palorus ratzeburgi Wiesm.)	0	3	3	5	8	2	4
Red flour beetle (Tribolium castaneum (Hbst.))	3	3	4	Tr.	13	0	4
Indian-meal moth (Plodia interpunctella (Hbn.))	0	0	1	3	0	9	2
Foreign grain beetle (Ahasverus advena (Waltl.))	0	0	0	1	1	2	1
Dermestidae (species not determined)	Tr.	Tr.	Tr.	Tr.	Tr.	1	Tr.
Long-headed flour beetle (Latheticus oryzae Waterh.)	1	0	0	0	0	0	Tr.
Weevils—							
Granary weevil (Sitophilus granarius (L.))	0	1	4	1	2	4	2
Lesser grain borers* (Rhizopertha dominica (F.))	2	Tr.	1	1	Tr.	0	1
Rice weevil (Sitophilus oryza (L.))	0	Tr.	2	3	1	0	1
Total number of insects observed	778	632	1,637	2,132	938	612	6,729

*Although not a weevil, this borer causes damage similar to that of the weevils.

Fig. 2—Wheat kernels which have been damaged by the rice weevil. Note the sharp-edged holes made by the insects which fed from the interior of the kernel. These are typical examples of weevil damage.

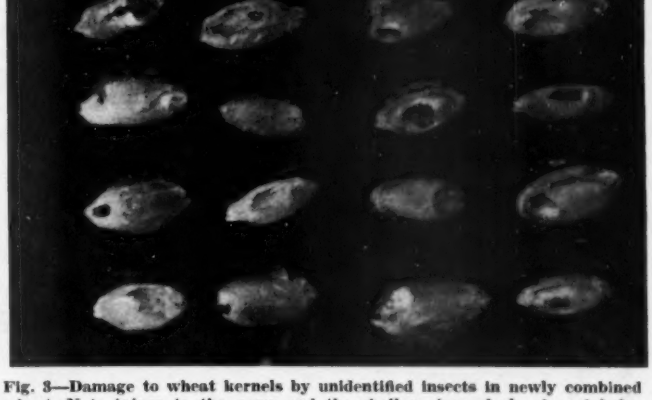


Fig. 3—Damage to wheat kernels by unidentified insects in newly combined wheat. Note injury to the germ and the shallow, irregularly shaped holes with rounded edges. Damage not typical of stored grain insects.

Milling's Golden Era

The Plansifter and Other Sieve Machines

By W. D. Gray

EDITOR'S NOTE: The accompanying article is the 16th in a series of articles being reprinted under the general title, "The Golden Era of Milling." The articles, which originally appeared in The Northwestern Miller more than 50 years ago, chronicle the changes in milling technology during the time of the introduction of the steel roller mill, the purifier, and other types of equipment. The author was a leading flour milling engineer of his time.

PROBABLY the most important problem before the millers of this country today, as regards milling machinery, is what they shall use to do all their bolting with. The question as to whether it shall be reels or sieves, I regard as pretty well settled, and I believe the most progressive millers will agree with me, and to those that do not I would advise them to "get on the band wagon" just as soon as possible, or they will be left behind and will eventually have to be picked up by the ambulance.

This may not necessarily mean that a first-class mill fitted up in good shape with the best type of flour dresser will have to be torn out and sieve bolters put in. The miller may add some and improve his condition and get along very well for a while, but it must certainly mean that the mill that has not got the best and latest equipment of reels should be at once overhauled and put into position to compete with its neighbors; and to anyone thinking of building a new mill it seems to me that he cannot afford to consider anything but a sieve bolter. Of course, we still expect that some good millers will question this conclusion.

However, when the miller has determined to adopt the sieve bolter, his troubles are by no means at an end, for there are numerous sieve bolters on the market and they vary in the mechanical construction and work fully as much as do the various types of reels, and each manufacturer proclaims his particular machine the best, so that the best way for the miller to proceed is to get a full understanding of the various machines as to their work, durability and mechanical construction, and he should see them in the mill at work and then decide for himself.

In your investigation you will find most of the machines with sieve boxes made in the form of an oblong. Some with level and some with pitched sieves, and one of these machines differing from all others in having its sieve box or cylinder round with level sieves.

The idea has been given out by someone over-anxious to get all the trade and to frighten the small millers, that his patents cover all gyratory machines, and to those that do not know, I will say that no one can cover the gyratory motion or sieves lying one on top of another. This is old and free to anyone. But it does not necessarily follow that there are no patents on these sieve bolters, and that the miller can, with impunity, take what he pleases, as I am sorry to say is often the case; for on all of these machines the manufacturers have patents that should be considered good until decided otherwise by the courts.

The Haggenmacher Plansifter

The Haggenmacher plansifter, I believe, was the first flat sieve bolter used in this country to bolt and finish flour. Other flat sieves using the gyratory motion had been used for scalping and grading before his time, as has been shown in a previous article, but Haggenmacher deserves great credit for perfecting and getting the machine to its present state of perfection, and I think he may well be considered the pioneer in this type of machine, viz., a rectangular sieve box with flat sieves and carriers to make the stock travel in any direction with a gyratory motion. The novel feature and patentable part of this machine are the flights on the side of the ways as shown in Fig. 1.

I believe this patent was in litigation in Liverpool about three years ago, and he lost his case, but I am of the opinion that it could not have been properly presented, or the results would have been different; for I believe he was the first to use this device and he is entitled to it and I would be very glad to see it sustained by our courts.

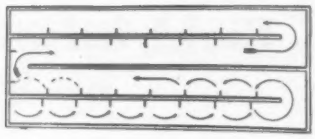


Figure 1

The cloth of this machine is cleaned by seeds, usually locust seeds, but sometimes wheat or other seeds are used. The seeds pass along with the stock on top of the silk from one cloth to another and when they have completed their course they are returned to the head of the machine again, being conveyed up a short stationary spiral conveyor, the motion of the machine throwing them up instead of turning the conveyor. This is a very neat device for this purpose, but it will be seen that the cloth must be cleaned from the top. This is regulated somewhat by taking from or adding to the volume of seed as the cloth requires it, and this change, I believe, can be made when the machine is in motion.

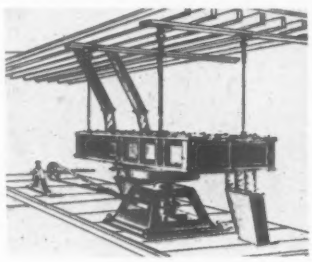
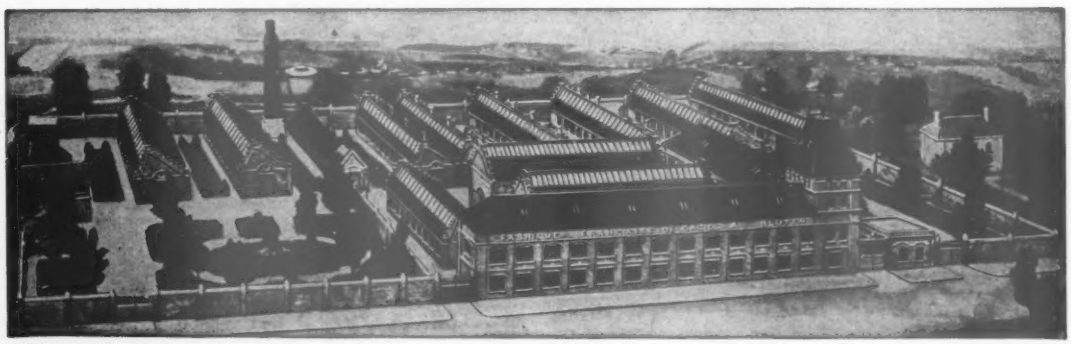


Figure 2

Fig. 2 shows the machine as it is hung in the mill. It is not self-con-



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tained, but it is hung by four hangers to timber bolted to the floor-beams over it, while the driving-shaft, step and pulley are supported on the floor immediately under the sieve-box. It is much more substantially built than it was when first placed upon the market, and if properly handled should give the operator very little trouble.

There is another of the same form but that possesses features peculiar to itself. The principal difference between this and the plansifter is that instead of the sieve-box being hung from above it supported from below on the four spindles that drive the machines, and seems to have more boxes, steps and eccentrics and wearing parts. The other difference is in the method of carrying the stock forward by the angle of the sieve crosswise. By giving attention to Figs. 3 and 4 and the following description,

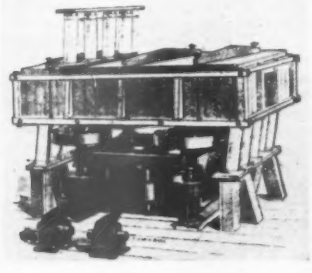

Figure 3

which is the language of the manufacturer, it will be easily understood.

"The case is strong and well made. The supports and driving parts are quite unique. The case is supported by a substantial iron frame with a broad base, in which are mounted on ball bearings four upright shafts. At the top of each upright shaft is a balance-wheel, which is connected crankwise with the lower part of the sieve case. The weight of the sieves and case is carried on ball bearings in these balance wheels. The pull and strain resulting from the centrifugal force developed by the machine's rapid movement are effectually counterbalanced at the four corners of the supporting base. The driving belt passes around a pulley on each of the upright shafts. Idlers are provided so that the sifter may be driven from either a horizontal or an upright shaft. The use of the four cranks for driving, supporting and directing, is said to make all the parts of the machine move in perfect unison and without jar or vibration.

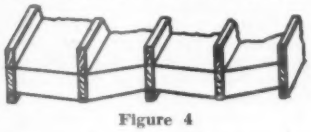

Figure 4

"The sieve frames are set in a horizontal plane, placed one above the other in a case, and are divided into parallel channels of width adapted to the material to be sifted, and to the construction of other parts of the machine which affect the sifting action.

"The sifting surfaces of these parallel channels lie horizontally in a longitudinal direction, but in cross section they are inclined, the degree of inclination being governed by the character of the stock to be treated and the speed at which the machine is to be driven. This cross inclination of the channel surfaces controls the longitudinal movements of the stock; inclination to one side propelling the stock longitudinally in one direction, and inclination to the other side producing longitudinal travel in the opposite direction.

"The inclination of the sifting surfaces is slight, and in practical operation the material to be sifted is spread in a thin layer over the whole bolting surface, where it is gently agitated by the movement of the sieve. The finer and heavier particles seek the cloth and are sifted through, while the courser and lighter particles rise to the surface and are floated off to the discharge opening. Means are provided for passing the stock from channel to channel in the same plane, or for dropping the stock through into any of the sieves below. One small machine will handle all the stock, from breaks to finish, in a mill of moderate size."

Fig. 5 shows another type of a machine designed to do the same class of work as the others. It differs in form and action somewhat from the fact that the stock is moved along on the sieve by having all its sieves pitched, and if the siftings of a sieve are to be carried back to the head of the machine, they are carried on a blank pitched in the opposite direction. So that a machine of this kind naturally must have the sieve-box very much deeper than the machine using the level sieve, and my judgment is that the less height and the higher to get the load above the eccentric or wrist-pin, the harder it is to balance and of coarse harder on the bearings, and the whole structure must necessarily be made very strong in order to stand these unnatural strains. The machine is said to have great capacity, and like the plansifter has the gyratory motion,

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but unlike it in the fact that this machine is self-contained.

The silk is kept clean by a piece of leather about 1 by 2 in. and a piece of carpet comes in contact with the silk, the sieve having the silk on top and coarse wire on the bottom. This cleaner is confined to this

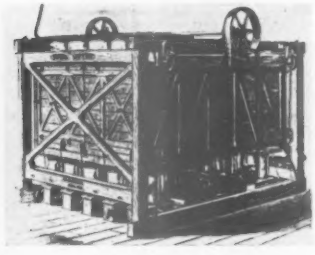

Figure 5

space. The gyrating motion of the machine keeps this little cloth cleaner in such a way that it is expected to keep the cloth clean, and the manufacturers of this machine say that it answers the purpose admirably.

There are other machines on the market that have the sieves pitched and the manufacturers claim much for them, but it is the intention of these articles to show and describe the various machines of each type. The principle of these bolters using the pitched sieve is the same and one may be better than another according to the care that has been taken with the little details in connection with the machine and to the kind and quality of the labor and material put into them.

As will be seen, some clean the silk with seeds traveling over the sieve with the stock. Another uses a chain fastened at one or both ends, lying loosely on top of sieve with the stock; and the last-described machine cleans its cloth from below. As the cleaning of the cloth seems a small item, let me remind the reader that is one of the most important things and one of the hardest problems connected with a sieve bolter, and anyone thinking of adopting this system of bolting cannot investigate this point too closely.

I would gladly have gone into the details of these machines more fully, and have shown and described them in detail if I had the necessary cuts and descriptive matter, but not having them at hand, must necessarily make this article brief. I believe it is a good thing to have so important a machine as this fully understood by the parties who are going to buy and use them, and if I have not done these machines justice I hope the manufacturers of them may feel disposed to more fully explain them, for if they are what they claim for them, they can only be benefited by a better understanding. Believing this doctrine, I will in the next article fully describe, with numerous cuts, all the parts of the Universal bolter, together with its operation.

An Utopian Fantasy —Ten Years Later

EDITOR'S NOTE—Ten years ago the late S. H. "Van" Stoltzfus of Kansas City delivered an address before the members of District 2, Association of Operative Millers. During those 10 years that have passed there have been many references to "that talk Van Stoltzfus made in Kansas City." The address was entitled "The Mill of Tomorrow—An Utopian Fantasy." Mr. Stoltzfus gave his imagination considerable liberty and the mill of tomorrow as he visualized it in his dream was quite a mill, to say the least. Events that have occurred in those 10 years since Van delivered his talk have shown that it was not so wild a dream after all. You will find in the accompanying article, reprinted from the AOM Bulletin of December, 1940, that he had prophesied many innovations. It is reprinted here 10 years later for your entertainment and edification.

* *

IT WAS on a Saturday afternoon, following a meeting of the Association of Operative Millers, that the topic of flour mills and flour milling machinery was brought up. The subjects discussed included new machines, new processes and many other topics peculiar to flour milling and particularly what flour mills might be like 50 years from now.

We discussed those subjects long and loud. After the post-meeting bull session I went home and, as a sedative before retiring, I eased myself into a comfortable chair before the fireplace. I picked up a small book and read an article about what rapid advances scientists and industrial research men had made by using the spectroscope in chemical and metallurgical analyses.

"With the spectroscope, engineers can look through a window of fused quartz into the cylinder of an internal combustion engine in operation and study the burning of the gases under pressure. . . . An entire trainload of pig iron can be tested in a few hours by a spectroscopist, without unloading the iron. . . . This instrument is at once a powerful tool for analysis, a super telescope, microscope, speedometer, thermometer, tape measure and clock. In each role it exceeds in range and power the more common forms of these devices. No wonder it has been called the Master Key to Science."

I began wondering why such an instrument, perhaps in modified form, could not be used to discover a now unknown media in flour as a measuring stick of its quality, thereby deashing ash forever, or as a device, enabling us to see through rolls in action against the product being ground, and to definitely know what work is being done and how; then sleep and oblivion overtook me.

Beginning of a Dream

I next remember looking out over a large city from the window of a luxurious airliner. I saw great buildings of luminous glass, stainless steel and porcelain like concrete, on the face of the tower of one of these buildings, I read a sign "Pillburn, Inc., The World's Largest Millers," I was interested, I wanted to know by what means this mill had become a world leader.

Immediately upon landing at the airport, I requested transportation to the mill and was told that taxicabs were not available, however, a Roto or a Gyro (not to be confused with certain high speed sifters) would deliver me at the mill in a few minutes. The roof of what appeared to

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This year, on its 10th Anniversary, the enrichment of flour and bread is being hailed as one of the most significant contributions of our time to the health and well-being of the American people.

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be the main offices of the company served as a landing field, a moving stairway quickly brought me to the main floor upon request, and after a short wait I was introduced to the general manager, Mr. Holloday, a prominent figure in the milling world.

I stated the reason for my call, whereupon he pressed a button and a living image of a distinguished looking man appeared in panel on his desk. To say that I was startled is putting it mildly, but Mr. Holloday took it all as a matter of regular routine and introduced the man as Mr. Hylan, his director of production, an eminent milling engineer and an honored member of the International Institute of Milling Technology. At the same time he requested permission be given for inspecting the milling plant. This request was readily granted. An escort was provided to direct me to the director's office, being assured I would be welcomed by the director himself.

Inter-Office Television System

By the television inter-office communicating system, Mr. Hylan had no doubt already carefully scrutinized my personal appearance, and would recognize me when I presented myself.

Outside the main office, I observed the adjacent towering building, of a new style of modernistic design surrounded by acres of green lawn, poplar trees, arranged shrubbery and brilliantly colored flowers. This building, symmetrical and straight lined, constituted both the storage and milling plant, a magnificent structure of glistening porcelain-like compound and moulded glass, extending into the sky at least 300 feet.

The moulded iridescent glass panelled seven story section, at the top at least 100 feet in height, housed the milling machinery proper, and the elevator distributing equipment for delivery of grain to storage. Within the lower section of the main structure, and below the bulk storage space, was housed the grain cleaning and grading machines; also the finished products, packaging units, loading and unloading equipment. All railroad switch tracks for loading and unloading were placed underground, no dangerous grade crossings, no railroad tracks, no railroad equipment of any kind was in sight nor was there any noise, dirt or smoke incident thereto.

Automatic Door Openers

Approaching the entrance to the milling structure, without apparent reason, the doors opened for us and closed again immediately upon our passing to the inside. We were quickly lifted to the director's office and control room, where my escort excused himself and disappeared.

The room was extraordinary in its appointments and unusual because of its polygon shape. All the wall spaces were covered with indicating and recording instruments, diagrams, charts, controls, television and radio panels; all were studded with constantly blinking green, red, white and blue lights, presumably reporting activity in the plant and production operations. I must confess I conjured up visions of intricate masses of delicate machinery and apparatus that would require such a maze of instruments for recording and controling the mill's operations. The unusual quiet atmosphere of the room intensified the feeling that here was something supernatural.

New Jobs, New Titles

Besides the director, the room was occupied by some 12 or more persons,

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earnestly and intently studying the visible report of the physical and chemical performances of all the component parts of the flour milling processes and products.

Illuminated signs on each desk of the occupants identified his individual zone of authority, such as: Director of Production, Assistant Director of Production, Superintendent of Milling Operations, Controller of Grinding Operations, Controller of Bolting Operations, Controller of Wheat Cleaning and Conditioning, Supervisor of Lubricants and Lubrication, Superintendent of Packaging and Loading, Chief of Laboratory Control, Chief Chemist, Research Engineer, Chief Mechanical Engineer, Chief Electrical Engineer, Safety Engineer, Radio, Television and Sound Engineer.

These names were conspicuous by their absence: Head Miller, Grinder, Bolter, Smutter, Oiler, Sweeper, Warehouse Foreman, Packers, Truckers, Electrician, etc.

Mr. Hylan, completing a conference with one of his assistants, came forward to greet me, calling me by name. He would only be too glad, he said, to show me about their newest plant, for which layout he was largely responsible.

Operations Recorded Automatically

Instead of going through this giant plant, since it required several hours and was tiring, Mr. Hylan suggested he first show me about the control room and explain the services automatically performed, regulated and recorded through the media of the many instruments we see about us.

On second thought he stated that he believed a tour through the plant by television would clarify their milling operations and better enable me to follow his explanations.

Immediately upon pressing the television control switch there appeared in one of the wall panels a vision, the replica of the first unit used in the milling system, a recording weighmeter, through which the wheat was delivered to a specific gravity cleaner and grader. This specific gravity machine as a single unit, Mr. Hylan stated, separates gravel, sand, screenings, cracked and shriveled wheat, and all foreign matter according to their respective physical characteristics. It also grades the wheat basis of values with respect to the finished flour.

Wheat that is of a higher quality than needed to produce the flour grade required is returned to storage, likewise wheat too poor in quality is also returned to storage. If the highest quality of wheat is required to produce a desired flour grade, all wheat not suitable is rejected and returned to storage for use at some future time when flour quality desired permits its use.

Improvement in Wheat

Pausing here to discuss the miller and his problems, Mr. Hylan informed me that the agronomists and wheat breeders had succeeded in providing a creaseless wheat, but the wheat berries were rounder and the size of the crease had been greatly lessened. Moreover, the number of varieties grown had been decreased and farmers were growing only the leading types of hard winter, hard spring, durum, soft winter and soft white wheats, making the matter of binning and mixing less complicated.

Smut had been eradicated and the campaign against cockle, garlic, buckhorn and other weeds had reached the point where little seed contamination (or even mixed wheat or wheat and oat mixtures) was encountered.

All wheats were subject to an electrical short wave treatment on entering the storage bins, effectively killing all insects, eggs and larvae.

The next images to appear in the panel were the units for cleaning and tempering the wheat after it has been graded for milling purposes. The cleaner consisted of a round metal tube, extending the full height of the building. Within this tube, Mr. Hylan informed me, is provided an adjustable spiral screen extending for the full height of the tube, the pitch or angle at which this screen is used controls the severity of the scouring action. At the bottom of this tube an exhaust fan is provided to discharge a blast of air upward through the tube, carrying with it scourings into a mechanical collector. Also provision is made for carrying away from the tube the heavier material which passes through the screen.

Wheat Tempering Device

The tempering tube, approximately the same diameter as the cleaning tube and of the same height, is steam jacketed. Within its wall are provided two perforated screen tubes of respectively smaller diameters, the interstice being used for the flow of wheat through the tube, thereby controlling the tempering time desired.

Warm vapor is passed through the interstices around and through the wheat. The temperatures and moisture, or vapor, necessary for tempering the wheat are automatically controlled by instruments mounted on the stock bin over the rolls, reflecting the condition of the wheat at that point.

For cooling the wheat and tempering the outer coating, a third tube is used. The wheat is dropped through this tube from the top, a fan being provided at the bottom of same discharging a blast of highly moisture laden air upward through this tube

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and into a mechanical collector, of the type previously mentioned. This blast of air is of sufficient velocity to insure the wheat being held more or less in suspension in its fall through the tube, giving it the opportunity to absorb and evaporate the moisture necessary for cooling and at the same time serve as an aspirator for the final cleaning operation before going to the stock bin. The humidity within this tube is automatically controlled by a humidistat operating in conjunction with a spray nozzle within the eye of the fan, and synchronizing with the instruments mounted on the stock bin, regulating temperature and moisture.

A wheat washer is used for wheats that require washing. The offal from the washer is recovered by means of a centrifuge, the contaminated water being clarified for its continued use with only the addition of sufficient water to maintain the flow necessary within the washer to do the job. This completed the wheat cleansing and condition system, the picture of each unit in turn appearing in the panel.

No part of the actual mechanical operations was visible, all machines having their respective mechanisms enclosed in streamlined housings of stainless steel and polished aluminum of pleasing design.

A second television panel was lighted, as Mr. Hylan turned a dial, informing me that the principal milling units would now appear in sequence.

A recording weight meter is used ahead of the first break to regulate the feed into and through a unique, specially designed electrical device for indicating and recording any variation in moisture and physical character of the wheat before going to the roll.

Then the roller mill appeared, strikingly different from the roller mill as I knew it. A special alloy is used for the outer shell of the mill roll proper. These shells are corrugated and ground to conform with the requirement and of such hardness that very little wear takes place. When it is necessary to replace these shells for a different type of roll finish or for replacement, they may be removed and replaced. The cylindrical housings, on which the outer shells are mounted, are hollow and dynamically balanced. Also the shafts or journals are hollow so that the bearings and the grinding temperatures may be controlled by the circulation of water through them.

It is possible also to bring the rolls to the desired temperature before starting the mill. This hollow roll also prevents bending and the consequent poor grinding results. Because of the metals available, it is possible to manufacture this roller mill with a very great saving in weight and in space occupied. The unit is made up of stainless steel structural shapes and highly polished streamlined housings, eliminating all exposed dust catching bearings and gadgets.

All rolls are fitted with automatic roll pressure indicating controls. The feeders are made to insure the specific gravity of the stock going to the roll being the same for the entire length of the roll, preventing products of heavy specific gravity falling to the center and those of lighter specific gravity falling to the outside. Each pair of rolls is fitted with a recording spectroscope, making visible the actual grinding action of the roll surfaces, operating at various pressures, speeds and differentials.

Mr. Hylan went on to explain that each roll is connected to a variable speed driving mechanism to permit variation in speed of both slow and fast rolls. The fast rolls, nine inches in diameter, are operating at 1,000 r.p.m., made possible because of the use of dynamically balanced rolls and metals available for high speed bearings. It is known, so far as bearing friction is concerned, regardless of speed, this curve is almost on a straight line. In other words, increased speed increases bearing friction only slightly. If at high speed the roll is doing twice the amount of work, necessarily the temperature of the roll chill is increased because heat generated from grinding is in direct proportion to the work being done. Objectionable high roll temperatures, however, are corrected by means of the automatic cooling system used.

Sifters for separating and grading, except for the clothing, are constructed entirely of polished aluminum and stainless steel alloys. The speed and the diameter of circle of gyration are controllable so that an ideal condition, so far as speed and slippage of stock on sieve is concerned, is maintained.

Controlled Humidity in Purifiers

The purifiers are of the specific gravity type using filtered air with controllable humidity. The grading of the middlings is first accomplished in the sifter and they are sent then to the purifiers for final grading and purification by combining air with specific gravity. The purifiers are made entirely of polished aluminum and stainless steel alloys, without conveyors and dust catching gadgets and bearings. The stock flows from the purifiers, after being graded, for junction with other similar stocks whose physical values favorably compare, as determined by the recording spectroscope.

No bran and shorts dusters or reels

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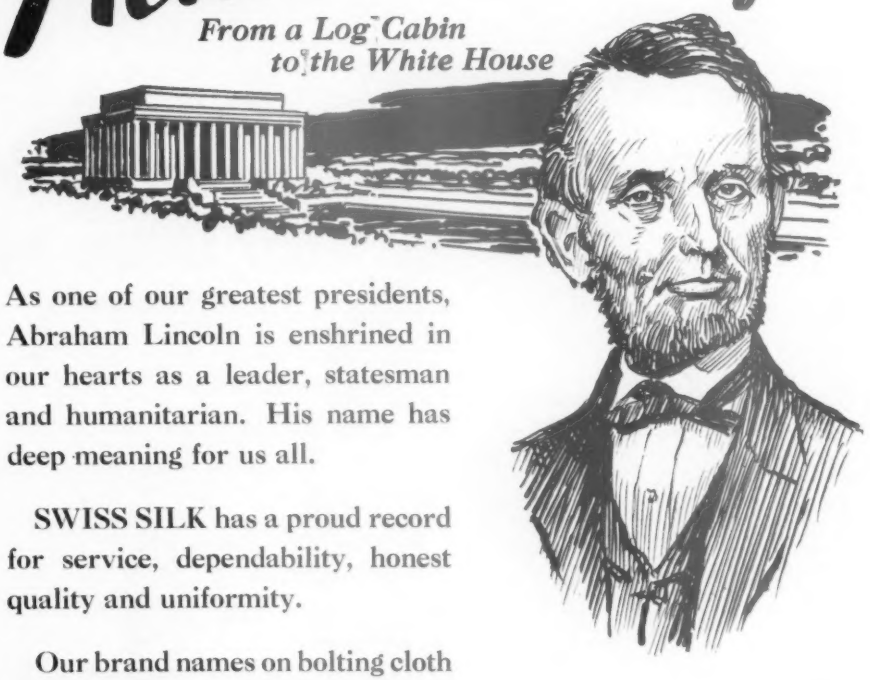

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are used, the sifter doing the work that would normally be accomplished with reels. A second system for grinding and bolting is provided for fifth break scalps, for further reduction and grading. The final products from this second system are spouted back into the first system, with the stocks, comparable in values as determined by the spectroscope, for final processing.

The humidity and temperature operating mechanism for the mill was almost totally enclosed, and because of this, I was assured, it was even more efficient. The controls guaranteed absolute synchronizing of any differing comparative humidities and temperatures required for the best results in all departments of the plant.

Fully Automatic Packaging System

Again the dial is turned and there appears in the panel the packaging room and its equipment, at least 150 feet below us and under the bulk flour storage tanks. Only one operator appears in the scene. Mr. Hylan informed me that aside from the stacking of the flour into the cars on underground tracks no other manual help is required. All packaging equipment is fully automatic. The selective conveying system to cars not only segregated packages of various sizes for distribution to the many cars being loaded, but by photo electric cell made the selection according to color of the label on the package.

The blending and packaging units, like all other mechanical units in the plant, were enclosed in polished aluminum or stainless steel housings, hence the operating parts were not visible.

I was informed it was possible to pack out the entire 10,000 bbl. daily capacity of the mill in 10- and 25-lb. packages in six hours. The 20 bulk flour storage bins provided for the storage of 15 days full running capacity. All blending for flour grades is made from these bins. No warehouse space for sacked or packaged products is provided or necessary; all products being delivered directly to cars for shipment after packing.

Pictures of equipment in other and minor departments followed in rapid succession, including that for germ separation and oil processing, cereal and feed milling, but I was more interested in asking question about the unusual features noted in our so-called tour through the plant, for example: The use of the record weigh meters on all the controlling streams in the mill.

No dust collectors of any type were visible. I was informed all exhaust fans contained within themselves an efficient collecting gadget.

Electronic Dust Collectors

I saw no indication of any dust on the floors or machines. Mr. Hylan informed me that controlled electrical energy was employed to collect and disseminate any and all dust from the air within the mill, that no sweeper was employed, no accumulation of dust was possible except from chokes. Any possibility in this connection is guarded against, and no chokes had ever occurred.

No shafting, bearings, pulleys, belting or transmission material of any kind was apparent in the television pictures shown. Mr. Hylan informed me there were none used except within the milling units themselves, all of which were direct motor driven. Where variable speeds were required, either variable electric or air motors were adopted.

Being deeply interested and fascinated by what I had seen, I was not aware that the room was housed in moulded iridescent glass and the walls only partially transparent. A statement from Mr. Hylan's secretary that heavy clouds and darkness were appearing made me curious to know why this did not affect the normal light in the office. I was informed, in reply to my question, that the lighting of the entire plant and office was controlled automatically and was not affected by sunlight or changing light from the outside. No shadows were possible and the strength or amount of light for best results were constantly and evenly maintained in all departments by concealed lights controlled by photo electric cells, the "lamplighter" to industry.

Some mention should be made of the interior of the mill building proper, and especially the roller floor. No interior columns or beams obstructed the view or marred the symmetry of the room. The floor of concrete was covered with heavy cork matting, a non-conductor of vibration and noise, adorned by harmonizing colors. The interior facing of the building columns were of colored tile and the panel walls of iridescent glass, all of this as a background for the six lines of roller mills of streamlined stainless steel was striking. A room reflecting harmony of color, beauty of design in a brilliant setting of colors of gold, silver, opal and emerald, a picture of Utopia if there ever was one.

Mr. Hylan informed me that all the floors of the mill were treated

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in more or less the same manner. This, he stated, was done to impel in his organization pride of plant, a picture of beauty and cleanliness for the visitor and an influence for the best in all of his employees.

He further stated the satisfactory operation of his mill required skilled technical men of character and ability. To secure such men the handwriting of applicants was analyzed and they were subjected to both physical and mental tests.

Instruments based on the galvanometer principle showed their reactions to different scenes portrayed on the television screen and to sounds emanating from the radio loud speaker. A composite chart drawn up from all tests indicated for what position they were best suited, whether in administration, production, sales or accounting work and they were placed accordingly.

Most of the men employed by his company were trained for advanced positions. There were no square pegs in round holes. Everyone was doing the kind of work which he liked the best and for which he was best fitted.

Mr. Hylan informed me that an employees' clubhouse adjoined the mill. No one was required to join but every employee was eligible. Nominal dues took care of part of the maintenance, thereby incurring a personal interest in its administration. Any annual deficit in the club's upkeep was defrayed by his company.

As an example of the thoroughness of his system, complete records were maintained of every bearing in the plant, where used, the type, when installed, how often requiring lubrication and with what type lubricant. I thought if Mr. Hylan had to keep such a record of the bearings as I remembered them in the same capacity mill with at least 4,000 bearings, of all types and patterns, the job would have floored him, I'm sure.

The flow of the mill was marked with symbols, indicating the amount of all stock in the mill passing a given point within a given time. A control sheet was constantly compared with similar streams from daily operations, all indicated by instruments mounted in the wall, these instruments recorded the results as measured by the weigh meters installed on the mill streams.

I noted the standardizing and interchangeability of parts of one milling unit with another, and within each individual unit. In remarking about it, Mr. Hylan stated the stock of spare machine parts for replacement was thereby greatly reduced.

I was deeply interested in the many instruments mounted on the walls of this polygon shaped control room. Every instrument was visible to all from any point in the control room.

Mr. Hylan, sensing my interest, at once turned to the nearest panels and in sequence explained the service each performed and the information it indicated and recorded, some of which follows:

Sound Recording. I wondered what could possibly be the use of sound recordings and the duties of a sound engineer in a flour mill. In answer to my question I was informed there were two main instruments on the board in the control room, one recorded the volume of the sound in "decibels" and the other showed changes in frequency of pitch. The two readings gauged by accurate calculation indicated the cause of the change and which particular unit in the mill was responsible. Any old miller who gauges the perfect operation of his plant by the absence of unusual noises, will recognize the services these instruments perform.

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Other instruments recorded roll pressures, roll temperatures, temperatures and moisture of the controlling mill streams, the temperature and moisture of wheat to first break roll and of all finished products, invisible mill losses, the weight of material ahead of grader and cleaner, the weight of each of the separations, and weight of the clean wheat to first break, and the finished products, and other data.

The colored lights noticed when I first entered the room, as surmised, were signals calling attention to any unusual variation in the operation of the milling processes.

Mr. Hylan must have noticed a look of amazement and bewilderment in my face. He laughingly assured me that there was nothing intricate or involved in the manipulation of a flour mill from a central control room. The first cost of such equipment and controls, he stated, was justified, and he pointed with pride to the fact his company was the largest of flour millers in the world.

At no time during my visit did Mr. Hylan mention ash. I wondered why. In answer to my question, he replied, because ash had no place in the milling processes as an indicator of flour quality; the spectroscope had proven that.

I prepared to leave, thanking him for the amazing things he had shown me. I apologized for taking up so much of his time and turned away toward the lift, when he suggested that before leaving I might be interested in seeing their actual milling processes made visible. Beckoning me toward a door on which appeared "Experimental Milling Processes Department. No Admittance," we entered and I beheld a glittering array of milling machinery in miniature, which Mr. Hylan informed me exactly duplicated the equipment and processes in the large mill; more amazing were the milling diagrams mounted on and across one entire wall of the room.

It was a living thing. Through tiny hollow tubes or veins flowed fluids of every conceivable color, each representing a mill stock, the whole a visible circulatory system of the milling processes.

Expressing my sensations and reactions, I again thanked my host for a most interesting and enjoyable afternoon. I entered the lift and on descending realized that something was wrong, a feeling that a terrible thing was about to happen, but I was helpless to do anything about it. The lift fell to earth with a crash, a very familiar voice cried: "Come on to bed; you've been asleep for four hours." I awoke with a start—the dream had vanished.

——BREAD IS THE STAFF OF LIFE——

Attorney Says Food & Drug Act Is "Unrealistic"

THE Food, Drug and Cosmetic Act of 1938 is "unrealistic," in the opinion of James M. Best, general counsel for the Quaker Oats Co., on the grounds that it does not take into account the natural moisture loss in hygroscopic food products such as flour and corn meal between the time it is packed and is delivered to the retailer.

Mr. Best, in an article in a recent issue of the Food Drug Cosmetic Law Journal, offers a correcting recommendation for the Act. The present regulation reads as follows:

"Variations from the stated weight or measure shall be permitted when caused by ordinary and customary exposure, after the food is introduced into interstate commerce, to conditions which normally occur in good distribution practice and which unavoidably result in a change of weight or measure."

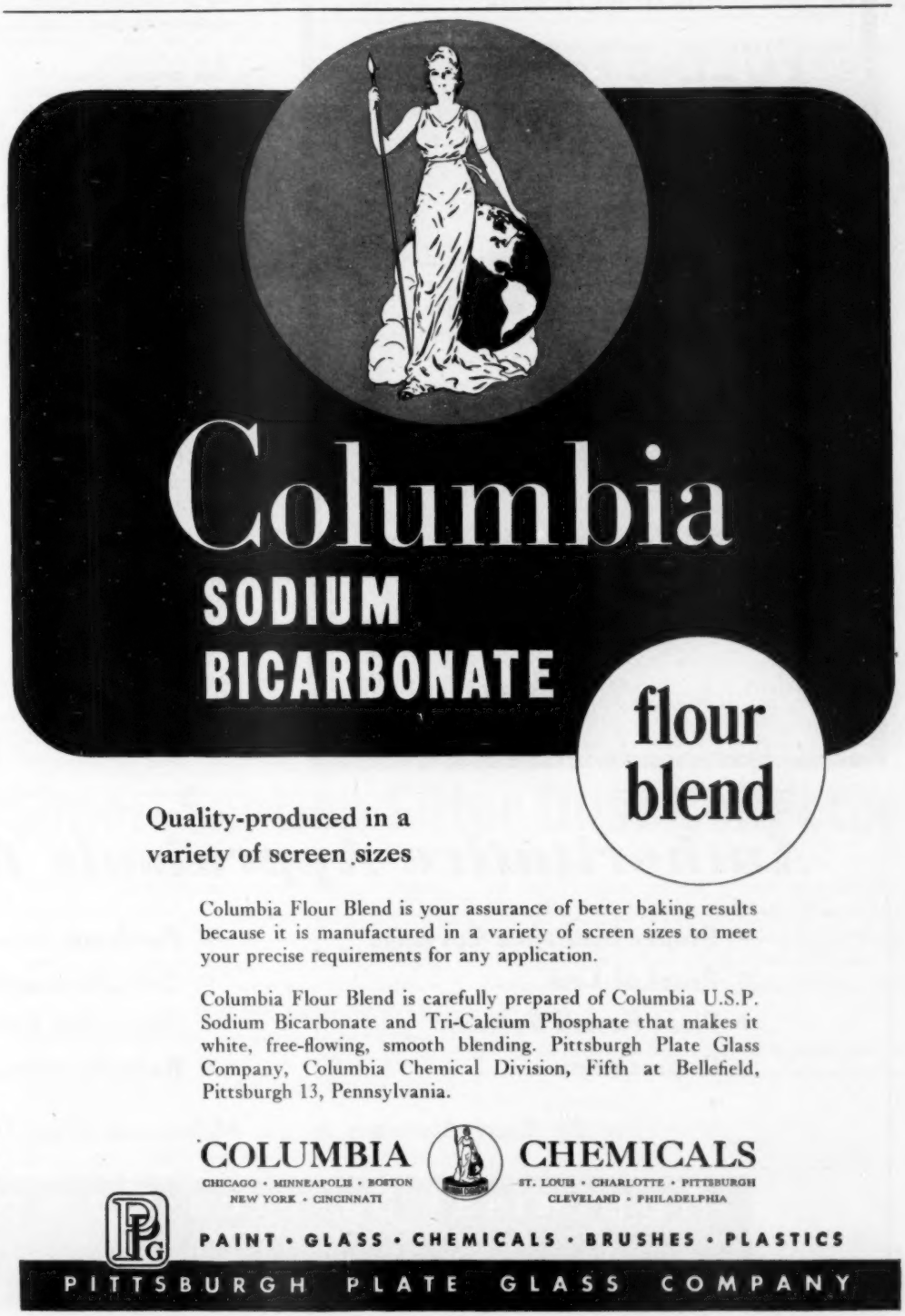
Mr. Best would delete the phrase, "after the food is introduced into interstate commerce," so that the regulation would read:

"Variations from the stated weight or measure shall be permitted when caused by ordinary and customary exposure to conditions which normally occur in good distribution practice and which unavoidably result in change of weight or measure."

The Food Drug Cosmetic Law Journal article, prepared by Mr. Best, was entitled "Weights of Hygroscopic Products." Direct quotations appearing in this review are quoted from the article with the permission of Mr. Best and the copyright owner, the Commerce Clearing House, Inc., Chicago, Ill.

Mr. Best prefaced his discussion of the weights of hygroscopic products with a review of a case several years ago wherein a quantity of corn meal which was manufactured in July and August, was shipped from a midwestern plant to Salt Lake City, Utah, and was placed in storage in the manufacturer's warehouse Sept. 6.

On Sept. 26, the corn meal was delivered to a customer in San Francisco. On Dec. 18 it was seized by the Federal Food and Drug Administration; the libel charged short weight. The manufacturer filed a claim and obtained an order of court permitting the taking of samples. These samples were delivered to a firm of independent consulting chemists who weighed them gross, tare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and net and made moisture tests by the accepted vacuum oven method.

Their findings showed the average net weight of product to be 23.74 oz.; that is, about ¼ oz. underweight, with an average moisture content of 11.51%. The net weight calculated to 14% moisture was 24.33 oz., which was well above the 24-oz. declared weight of the product.

While the libel action was pending, a preliminary hearing was held to determine whether criminal proceedings would be instituted. As a consequence, all of the pertinent facts were brought out and the manufacturer's counsel subsequently wrote to the Food and Drug Administration, requesting dismissal of the proceedings on the basis of the evidence disclosed in the hearing.

The then Assistant General Counsel for the Food and Drug Administration refused to dismiss the case, saying that:

"Representatives of the Food and Drug Administration have reviewed the findings upon which seizure recommendation was based and are still convinced that they are in a position to prove that this shipment was short weight on the dates on which it was introduced into interstate commerce at Salt Lake City, Utah.

"Your plea for dismissal of the libel on the grounds that the shortage of weight is due to loss in moisture cannot be given consideration because the permissible variations in declared weights due to moisture loss apply only where moisture loss occurs after the article is shipped in interstate commerce, as set forth in regulation (k) (1) under Section 403 (e) of the Federal Food, Drug and Cosmetic Act. . . ."

"Thus it appears that if the manufacturer had warehoused the corn meal in a humid area where there would have been little moisture loss, the product would have been lawful, but because it was warehoused in arid Salt Lake City it became unlawful," Mr. Best states in the article.

The original Federal Food and Drug Act of 1906 did not require any declaration of the net weight of the contents, but required only that, if it was stated, the declaration be made plainly and correctly on the outside of the package. Regulations under the 1906 Act authorized variations if the manufacturer elected to declare the net weight. Those regulations indicated, however, that where there was short weight because of a lack of moisture, there still must have been as many packages above weight.

The Gould Amendment to the 1906 Act required that manufacturers show the weight, measure or numerical count of the contents of the packaged food. The amendment also provided that reasonable variations should be permitted and tolerances and exemptions should be established by rules and regulations.

Following adoption of the Gould Amendment in 1913, regulations were prepared which explicitly recognized discrepancies in weight or measure due exclusively to differences in atmospheric conditions in various places, without limitation as to when or where occurring.

Mr. Best explains in his article that the Food, Drug, and Cosmetic Act of 1938 requires "an accurate statement of the quantity of the contents in terms of weight, measure or numerical count." The present law does not contain any proviso for shrinkage.

Federal Regulation "Unrealistic"

He says that the present federal regulation is "unrealistic" in not recognizing that the product may go into the manufacturer's floor stocks at his plant or warehouse for a period before a shipment to customers.

"Generally, the greatest moisture loss occurs within the first two weeks following manufacture, so if the product has been in dry storage there is every likelihood that some, if not all of it, will be under the declared weight unless the moisture loss is taken into account. The effect of the regulation is to require that a manufacturer make only so much of a product as he can rush into a car for immediate shipment to a customer in another state. Wasteful speed of shipment should not be the criteron of whether a product is lawful or not. Good distribution practice recognizes holding stocks for a reasonable

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period in a plant or warehouse," he argues.

The author also points out that "the Administration does not weigh the product at the customer's plant. The product is weighed sometime after it has completed its interstate journey."

"How, then, except by circumstantial evidence," he asks, "does the Administration expect to prove its case that the product was underweight at the time of shipment?"

Mr. Best's recommendations for correcting the unrealistic present law is stated by him as follows:

"Requiring manufacturers to understate the weight or overpack and charge the consumer therefor benefits no one. Consumers are not being cheated if the sensible solution, weight at the time of packing, recognizing reasonable variations thereafter occurring, is adopted.

"All that is necessary is to drop from the present regulation the words 'after the food is introduced into interstate commerce' so that the regulation will read:

" 'Variations from the stated weight or measure shall be permitted when caused by ordinary and customary exposure to conditions which normally occur in good distribution practice and which unavoidably result in change of weight or measure'."

—BREAD IS THE STAFF OF LIFE—

Experiment Station Reports on Value of Mold Inhibitors

A PRELIMINARY study conducted at the Kansas Agricultural Experiment Station has indicated that presently available commercial preservatives "did not prevent mold growth and spoilage in sorghum grain and alfalfa hay" when the latter were stored with high moisture contents.

The study was made jointly by the departments of milling industry, chemistry and agronomy of the experiment station. A report, "Progress Report No. 6—Preliminary Study of the Influence of Certain Commercial and Laboratory Preservatives on the Deterioration of Damp Sorghum Grain and Alfalfa Hay," has been published by the station.

It was stated in the report that the deterioration of crops in storage due to excessive moisture content is a major agricultural problem. Dampness in grain or hay, due to either immaturity or wetting after maturity, results in heating and molding during storage with resulting loss of palatability and quality.

"In the past the only reliable method for handling damp or immature crops was adequate drying before storage," the report states. "Recently, however, a number of preparations have been offered for sale with the claim that they will prevent the molding and heating of damp grain and hay during storage. These products, manufactured under a basic patent, contain essentially sodium carbonate, sodium bicarbonate, calcium carbonate and magnesium carbonate. Claims for their effectiveness are based on the hypothesis that moisture and acids in, or on, the grain or hay cause the release of carbon dioxide from the carbonates, which displaces air from the grain or hay and thereby prevents heating and mold growth."

The tests conducted at the Kansas Agricultural Experiment Station were made with two commercially available products which were obtained from commercial stocks in Kansas by inspectors of the Kansas State Board of Agriculture. These products, according to the published report, were "Hesse Hay and Grain Drier and Fireproofer" manufactured by the Hesse Co., Sioux City, Iowa, and "VHC-9," prepared by the H. D. Campbell Co., Rochelle, Ill.

In addition of the two commercial preservatives, two chemicals which are known to be effective mold-inhibiting agents for damp grain under laboratory conditions were used for comparison. The two chemicals were thiourea and a 1:1 mixture of propylene oxide and carbon tetrachloride.

The tests were made at two rates of application: At 8 lb. per ton (the highest level recommended by the manufacturers) and at 40 lb. per ton. Dry Atlas sorghum grain was used as the grain in the tests. The grain was divided into several representative lots and the lots were tempered with water to moisture levels of approximately 11, 16 and 20%. The preservatives were mixed at the rates indicated above and the grain was stored in sealed quart fruit jars at 80° F. for two, four, six and eight weeks, respectively. Untreated samplies were stored at the same time at the three moisture levels. These untreated samples served as controls.

Similar storage studies were conducted with alfalfa hay. The appearance and odor of the stored samples at the ends of the respective storage periods were recorded.

Respiration studies were also made on the sorghum grain since a great increase in respiration occurs when molds are present, due to the respiration of the molds themselves.

Mold growth and odor development occurred only in grain samples containing 16 and 20% moisture, the report states. "In a few cases mold was not visible even on high moisture samples, although musty or sour odors indicated that some undesirable changes had occurred. It is to be emphasized that at the various time intervals dif-

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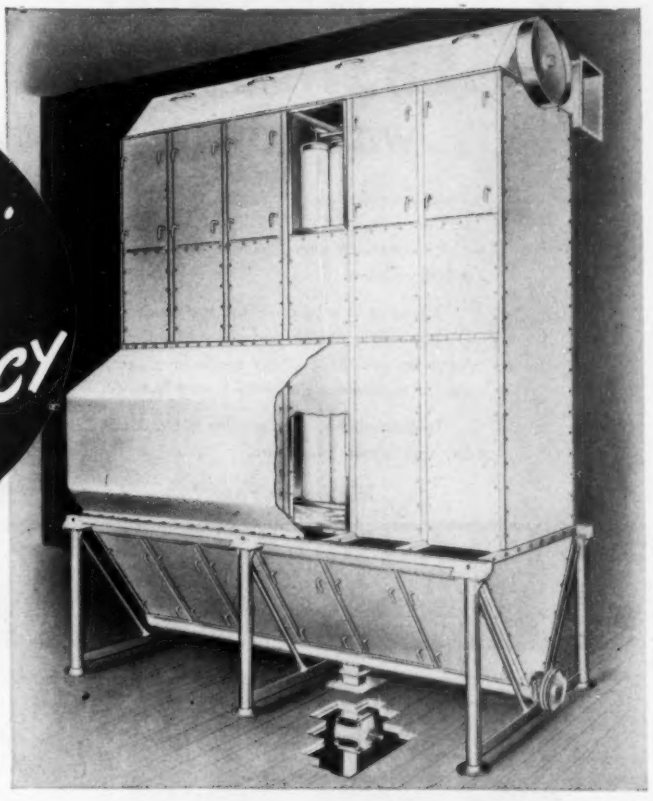

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ferent jars of material were examined."

The report added that "mold growth occurred in most of the jars of high moisture content and was equally prevalent in jars of grain treated with Hesse Drier and VHC-9 as in the controls. In the samples treated with thiourea, mold formation was inhibited, but undesirable odors were present. The propylene oxide-carbon tetrachloride mixture prevented molding, but any off odors that might have been produced were covered up by the odor of the carbon tetrachloride used in the treatment."

In the alfalfa samples, little molding occurred at the 20% moisture level in any of the treatments. At the high moisture level (60%), however, profuse molding and development of undesirable odors were found in all samples, including those treated with thiourea.

Copies of the report may be obtained by addressing a request to the Director of the Kansas Agricultural Experiment Station, Manhattan, Kansas, referring to Progress Report No. 6.

—BREAD IS THE STAFF OF LIFE—

FLOUR STORAGE STOCKS GET ATTENTION OF FDA

WASHINGTON—Published reports of disposition of cases involving alleged violations of the Pure Food, Drug and Cosmetic Act indicate that inspectors of the Food and Drug Administration are giving more and more attention to flour stocks held in storage after shipment in interstate commerce.

In four of six actions involving flour which were reported in the FDA publication, "Notices of Judgment Under the Federal Food, Drug and Cosmetic Act," issued in February, the nature of the charge included the statement that the product "was held for sale after shipment in interstate commerce." The lots of flour seized varied from 17 to 34 100-lb. bags.

A deficiency in vitamin enrichment was the cause of one of the six actions. The milling company involved entered a plea of nolo contendere and was fined $100.

In the sixth case, the court issued a permanent injunction, "perpetually enjoining the defendant from introducing and delivering for introduction into interstate commerce" buckwheat flour and corn meal adulterated as alleged in the FDA complaint, which stated that the defendant maintained insanitary warehousing and manufacturing facilities.

The publication also contained a report of condemnation of 1,600 bu. of musty wheat, which rendered it unfit for food.

Copeland Mills

(Continued from page 1a)

a conventional unit of about the same capacity as the pneumatic unit, housed in the same building. According to the meters on the electric switchboard, the 1,300-lb. pneumatic unit does not consume any more electricity than the old style unit equipped with bucket elevators.

The pneumatic unit is powered by four motors with a total horsepower rating of 330, divided as follows: a 250 h.p. motor drives all roll stands, three bran dusters and the diffiusors; a 25 h.p. motor is used on the sifter drive for 10 sifters; three high-pressure fans require a total of approximately 50 h.p., and one low-pressure fan for exhausting the dust collectors and recirculating air uses 5 h.p.

The flow of the pneumatic mill probably is typical of what is regarded as the British "long system" of milling. A U.S. miller's first reaction to the system is that the Britishers are extravagant with their use of roll surface because of first, the number of rolls in the system, and second, because of the comparatively light feed put on the rolls.

The Copeland mill contains 22 double roll stands, each with 10 by 40 in. rolls, or 44 single sets. That roll surface totals 1,760 linear inches, equal to 1.33 in. per barrel of capacity. Translated into roll surface per sack, for the benefit of U.S. millers, that roll surface is equal to 0.69 in. per sack of capacity. Millers in the U.S. will agree that is "a lot of roll surface."

The surface is divided as follows: 17 stands (single) in the break system; 22 single stands in the reduction system, and two singles (one double stand) used as scratch rolls on coarse and fine sizings.

All stands are equipped with sleeve bearings and silent chain differential drives. Each side of the double roll stand is driven independently by belts from the line shaft to pulleys on the fast rolls.

On the break system the fast rolls are driven at 400 r.p.m. with a 2½:1 differential which gives the slow roll a speed of 160 r.p.m.

With newly corrugated rolls, the first three breaks are run dull to dull until there is some wear on them, then are run sharp to dull. All corrugated rolls are symmetrical, that is, they can be turned end-for-end, since the journals are of the same diameter and length.

In the reduction system, the fast roll is driven at 300 r.p.m., with a differential of 1¼:1 which gives the slow roll a speed of 240 r.p.m.

The roll stands are equipped with the Simon "Feedmaster" feeders which are pivoted to distribute the stock evenly over the entire length of the roll and the feeder also regulates the amount of stock to the roll.

All roll stands in the break system are set to a definite release percentage, as follows: 1st break, 25% through a 20W; 2nd break, 45% through a 20W. The 1st break stock is split so that the overs of a 10W go to the 2nd break coarse roll and the overs of a 20W go to the 2nd break fine roll. The 2nd break stock also is split into 3rd break coarse and 3rd break fine. On the 3rd break coarse, the rolls are set to obtain a release of 40% through a 28W and the 3rd break fine roll is set to obtain a release of 55% through a 28W.

All stock is handled pneumatically. Two double stands are used on 1st break and there are separate conveyors for each set of rolls, making four separate streams of stock from 1st break. This was necessary because of the total weight of the first break stock made it more economical to handle in four streams, rather than to consolidate it into two streams. All four streams go to the same sifter.

54 Collectors in System

A total of 54 collectors are required to handle the mill stocks. The collectors, of a special design developed by Simon pneumatic engineers, are of the same height, but differ in diameter, depending upon the volume and physical nature of the stock to be handled.

Rotary air locks are used to seal the collectors from the spouting which transfers the collected stock to sifters or purifiers. The locks under-

neath the collectors are machined to a tolerance of 15/1000 inch, and are driven from a common line shaft.

Three high-pressure fans are used in the pneumatic conveying system, making it, in effect, three independent systems. One fan handles part of the break system, the second fan handles the remainder of the break system and the reduction system, while the third fan handles the purifiers, bran dusters, etc.

Roll suction is, of course, "a thing of the past" with pneumatic systems. The pneumatic system itself supplies any roll suction needed. The doors on the Simon roll stands are machined to admit the correct amount of air which is pulled over the rolls and follows the stock through the hopper into the spouting where it is conveyed to the cyclone collectors, then the air passes through Simon suction filter dust collectors.

Five of the filter dust collectors are used in the Copeland mill. Each collector has 64 cloth tubes 8 inches in diameter and 8 feet in height. Each filter collector handles between 6,000 and 7,000 cubic feet of air per minute.

Three of the five filters are used in the pneumatic conveying system—one filter for each of the "sub-systems" mentioned earlier. The remaining filter collectors are used in handling the air exhausted from the cyclone collectors handling the purifier air streams. All filter dust is sent to the 4th and 5th break sifter for classification.

Ample Sifter Surface

The sifters—10 in all—are 6x16 Simon "Flowmaster" sifters of the free-swinging type, driven at a speed of 200 r.p.m. One 25 h.p. motor drives all sifters in addition to supplying the small amount of power needed for the three suction filter dust collectors on the pneumatic handling system.

The purifiers are Simon Type "P" machines and are built of wood. A total of 10 purifiers is used. Double screw conveyors pick up the stock after it has passed through the sieves. U.S. millers probably will conclude that the British are extravagant also with purifiers as well as with roll surface. The purifiers are 36 inches by 84 inches in dimension.

Practically all of the machinery in the pneumatic mill was manufactured by the Simon company. Carter Millerators, Scalperators and seed machines were very much in evidence in the mill's wheat cleaning department—or, as the British call it, the screen room.

The appearance of the mill is pleasing to the eye. All of the roll stands, suction filter dust collectors, cyclone collectors and spouting is painted a light buff color. The sifters and purifiers are finished in natural wood. The floors are maple and a thorough job of housekeeping is done.

All Motors Interlocked

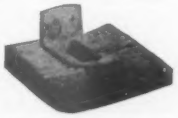
All of the motors which supply power to the pneumatic mill are interlocked through a master control board and the controls are so wired that if the motor driving the sifters, for instance, should stop, motor driving the roll line is turned off. The roll drive motor, however, can be shut off without stopping the pneumatic conveying fans, sifters or purifiers.

When the mill is started, the pneumatic system fans are started first, and allowed to operate independently of the rest of the other machinery for a stated time in order to make sure that all conduits carrying mill stocks are empty.

One of the principal advantages of the pneumatic system observed was the absence of choke-ups which ordinarily cause a shut down or require removal of a large quantity of stock after the choke-up is cleaned out.

The Simon "diffusor" has a flap valve arrangement as an integral part of the mechanism. The valve is hinged at the top and is hung at an angle from the vertical. A counterbalancing weight holds the valve open while there is no suction in the conduit. When the fans are started, the suction in the conduit automatically closes the valve and it remains closed unless a choke-up occurs.

In the event of a choke-up, the diffusor (which is, in effect, a miniature agitator) throws the excess stock against the flap valve and the pressure of the stock is greater than the pressure of the suction. Result: The flap valve opens and stock in excess of that which the air stream can



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handle is ejected on to the floor. When there is no longer more stock in the conduit than the air can convey, the valve automatically closes. About 50 lb. of stock was ejected in one choke-up which was observed.

Wheat ground on the new mill is conditioned for milling with the Simon "Stabilisor," a machine similar in principle to the Forster short-time conditioner. The wheat is discharged from the Stabilisor at a temperature of about 140° into a water bath for cooling, then the excess moisture is removed in a Simon "Viskator," a device which circulates warm, dry air through the wheat as it passes through a cooling chamber. The wheat leaves the Viskator at approximately 85° and is held in a short-temper bin for about six hours. It goes to the first break rolls with a moisture content of 16%.

The evaporative loss of moisture during the milling process totals about 2%, with the flour being packed off at a moisture content of slightly less than 14%. That small loss in a pneumatic system seems to many to be subject to question. These factors should be kept in mind, however: (1) The mill stocks are not in the air stream for any appreciable length of time. (2) The stocks come from the mills at much lower temperatures than U.S. millers are accustomed to. The roll speeds are much lower and the rate of feed on the rolls is considerably less than the accepted practice in the American milling system. Therefore, the air temperature is lower, which, in turn, means that the capacity of the air for moisture is less. (3) The air in the mill is recirculated. The exhaust from the suction filter dust collectors is transferred through ducts to lower floors of the mill. This feature makes it possible to maintain the atmospheric temperature and humidity in the mill at farily constant levels.

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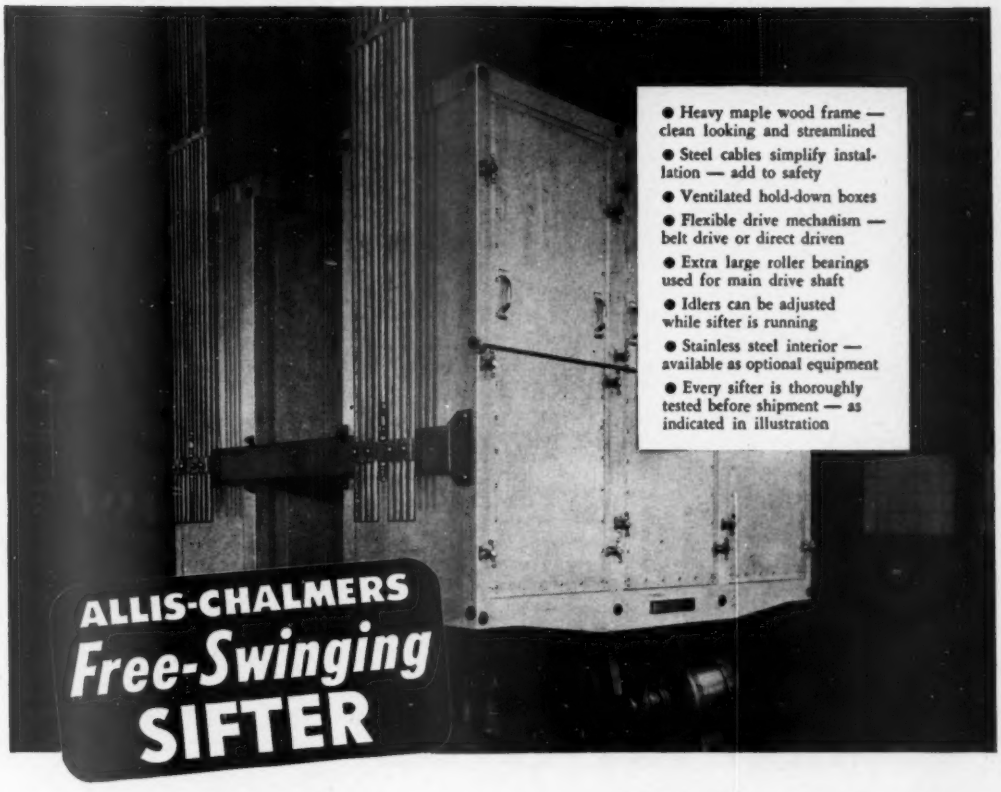

- Heavy maple wood frame — clean looking and streamlined
- Steel cables simplify installation — add to safety
- Ventilated hold-down boxes
- Flexible drive mechanism — belt drive or direct driven
- Extra large roller bearings used for main drive shaft
- Idlers can be adjusted while sifter is running
- Stainless steel interior — available as optional equipment
- Every sifter is thoroughly tested before shipment — as indicated in illustration

An Important Contribution to Greater Sanitation

MILLERS EVERYWHERE are discovering the advantages of this sanitary new free-swinging sifter. One large eastern milling company purchased one of these units . . . tested it thoroughly in production . . . and then ordered *15 more!* The merits of the machine were proven under every-day working conditions.

MANY OUTSTANDING FEATURES

Modern from top to bottom—inside and out — this streamlined Allis-Chalmers sifter has many features designed for improved functional operation. The ventilated hold-down box is arranged for air suction attachment — providing ventilation through sieve channels on hot, moist products. Box lining can be stainless steel or wood, as preferred. Sieves are Nordyke type of wood construction, screw assembled for quick and easy maintenance. Other outstanding features are listed above.

SIZE FOR ANY NEED

Allis-Chalmers free-swinging sifters are available in two, four and six sections with 12, 17, 22, or 27 sieves in each section.

Contact any A-C sales office for full details or write direct. Ask for bulletin 06B7180. A-3150

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